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US006451567B1

(12) **United States Patent**
Barclay

(10) **Patent No.: US 6,451,567 B1**
(45) **Date of Patent: Sep. 17, 2002**

(54) **FERMENTATION PROCESS FOR PRODUCING LONG CHAIN OMEGA-3 FATTY ACIDS WITH EURYHALINE MICROORGANISMS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/461,709**

(22) Filed: **Dec. 14, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/968,628, filed on Nov. 12, 1997, now abandoned, which is a continuation of application No. 08/461,137, filed on Jun. 5, 1995, now Pat. No. 5,688,500, which is a continuation of application No. 08/292,490, filed on Aug. 18, 1994, now Pat. No. 5,518,918, which is a continuation of application No. 07/962,522, filed on Oct. 16, 1992, now Pat. No. 5,340,742, which is a continuation-in-part of application No. 07/911,760, filed on Jul. 10, 1992, now Pat. No. 5,340,594, which is a continuation of application No. 07/580,778, filed on Sep. 11, 1990, now Pat. No. 5,130,242, which is a continuation-in-part of application No. 07/439,093, filed on Nov. 17, 1989, now abandoned, which is a continuation-in-part of application No. 07/241,410, filed on Sep. 7, 1988, now abandoned.

(51) **Int. Cl.**[7] **C12N 1/00**; C12N 1/12; C12P 1/02; C12P 39/00; C12P 7/64

(52) **U.S. Cl.** **435/134**; 435/42; 435/135; 435/171; 435/243; 435/257.1; 435/946

(58) **Field of Search** 435/243, 257.1, 435/946, 134, 42, 171, 135

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(57) **ABSTRACT**

A process is provided for growing the microflora Thraustochytrium, Schizochytrium, and mixtures thereof, which includes the growing of the microflora in fermentation medium containing non-chloride containing sodium salts, in particular sodium sulfate. In a preferred embodiment of the present invention, the process produces microflora having a cell aggregate size useful for the production of food products for use in aquaculture. Further disclosed is a food product which includes Thraustochytrium, Schizochytrium, and mixtures thereof, and a component selected from flaxseed, rapeseed, soybean and avocado meal. Such a food product includes a balance of long chain and short chain omega-3 highly unsaturated fatty acids. Further, a process for producing lipids includes a fermentation by growing euryhaline microorganisms which are capable of producing 1.08 grams per liter of the fermentation medium per day of long chain omega-3 fatty acids per 40 grams of sugar per liter of the fermentation medium at a sodium ion concentration of 60% seawater. The lipids are then extracted from the euryhaline microorganisms.

14 Claims, 8 Drawing Sheets